

CLAIMS

What is claimed is:

1. A combination lock washer and spindle bearing assembly, comprising:

a spindle having:

a spindle shoulder; and

5 a spindle end extending outward from the spindle shoulder with an uninterrupted thread configuration;

a thrust washer disposed about the spindle shoulder and having at least one outer retaining feature;

10 a nut disposed about the uninterrupted thread configuration, having:

a nut body with at least one nut retaining feature;

and

15 an inner circumferential shoulder extending from the nut body in direct contact with the thrust washer forming a pocket between the thrust washer and nut body; and

a lock washer disposed about the inner circumferential shoulder and retained within the pocket between the thrust washer and nut body, and having:

20 at least one washer extension corresponding to and engaging each outer retaining feature of the thrust washer, and

at least one nut extension corresponding to and engaging each nut retaining feature of the nut; and

25 wherein the thrust washer, lock washer, and nut may be at any angle relative to one another allowing for infinite adjustment positions and the lock washer prevents relative rotation between the spindle, thrust washer, lock washer, and nut.

2. The assembly of claim 1 wherein:
the at least one washer extension comprises at least one washer tang corresponding to and engaging each outer retaining feature of the washer, and
5 the at least one nut extension comprises at least one nut tab corresponding to and engaging each nut retaining feature.
3. The assembly of claim 1 wherein the lock washer and thrust washer are engaged as a sub assembly.
4. The assembly of claim 1 wherein:
the at least one washer extension comprises at least one washer tab corresponding to and bent into engagement with each
5 outer retaining feature, and
the at least one nut extension comprises at least one nut tang corresponding to and snapping into engagement with each nut retaining feature.
5. The apparatus of claim 4 further comprising:
at least one additional washer tab suitable to engage portions of the thrust washer adjacent the washer retaining feature.
6. The assembly of claim 4 wherein:
each nut retaining feature comprises an outer groove; and
each nut tang is received in the outer groove.
7. The assembly of claim 4 wherein each nut retaining feature and nut tang are configured to fit within a standard installation socket with the nut tang engaged within the nut retaining feature.
8. The assembly of claim 7 wherein the lock washer and nut are sufficiently engaged to be provided as a sub-assembly.

9. The assembly of claim 1 further comprising:
the outer retaining feature comprising a flat outer edge.

10. The assembly of claim 1 further comprising:
the spindle shoulder having at least one spindle retaining
feature; and
the thrust washer having at least one inner retaining
5 feature corresponding to and mating with each spindle retaining
feature.

11. The assembly of claim 9 wherein the spindle retaining
feature is a flat spindle surface and the inner retaining feature
is a flat inner retaining feature.

12. The assembly of claim 11 wherein the inner retaining
feature of the thrust washer is a keyway shape and the spindle
retaining feature is a shape corresponding to and mating with the
keyway shape of the thrust washer.

13. The assembly of claim 11 in which the spindle
retaining feature includes longitudinal splines and the thrust
washer includes teeth corresponding to and mating with the
longitudinal splines of the spindle.

14. The assembly of claim 1, comprising:
the spindle shoulder having a spindle retaining feature
comprising a flat spindle surface;
the thrust washer retaining feature comprising a flat outer
5 edge, and a flat inner edge engaging the flat spindle surface;
the nut retaining feature comprising an outer groove; and
the washer extension comprising a tab engaging the thrust
washer, and

the nut extension comprising a tang engaging the outer
10 groove of the nut body.

15. A combination thrust washer, lock washer and nut assembly, comprising:

a thrust washer having at least one outer retaining feature;

a nut disposed adjacent the thrust washer, having:

5 a nut body with at least one nut retaining feature;

and

an inner circumferential shoulder extending from the nut body in direct contact with the thrust washer forming a pocket between the thrust washer and nut body; and

10 a lock washer disposed about the inner circumferential shoulder and retained within the pocket between the thrust washer and nut body, and having:

at least one washer tab corresponding to and engaging each outer retaining feature, and

15 at least one nut tang corresponding to and engaging each nut retaining feature; and

wherein the lock washer is suitable for preventing relative movement between the thrust washer, lock washer, and nut.

16. A lock washer comprising:

at least one washer tab suitable for bending into engagement with an adjacent thrust washer retaining feature to prevent relative rotation between the lock washer and thrust

5 washer; and

at least one nut tang suitable for engaging an adjacent nut retaining feature to prevent relative rotation between the lock washer and nut.

17. The lock washer of claim 16 wherein:

the at least one washer tab includes a plurality of washer tabs extending from the outer diameter of the lock washer; and

5 the at least one nut tang includes a plurality of nut tangs extending from the inner diameter of the lock washer; and an inner diameter suitable for mounting around an adjacent nut shoulder; and

10 wherein the thrust washer, lock washer, and nut may be at any angle relative to one another allowing for infinite adjustment positions and the lock washer prevents relative rotation between the thrust washer, lock washer and nut.

18. The lock washer of claim 16 wherein:

the at least one washer tab comprises a plurality of washer tabs extending from the outer diameter of the lock washer and are equally spaced apart from one another; and

5 the at least one nut tang comprises opposing nut tangs extending from the inner diameter of the lock washer.

19. The lock washer of claim 16 wherein the lock washer is stamped from steel.